



Temporal and spatial association between human psittacosis in the general population and poultry farming in the Netherlands, 2000 – 2013

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Introduction

Psittacosis is a relatively unknown zoonotic disease, highly under diagnosed and commonly linked to psittacine birds. Psittacosis is also endemic in poultry, but the risk for people in the surrounding areas is unknown. Therefore our study aimed to explore the possible spatial and temporal association between human psittacosis infections in the general population and poultry farming in the Netherlands from 2000 – 2013.

Conclusion

Both chicken processing plants and slaughter duck farms seem plausible sources of psittacosis in people in surrounding areas. This indicates a need for more detailed work on poultry related pathways of exposure. Such work could include surveillance in poultry, people and the environment (e.g. air measurements), and genotyping of *C. psittaci*. Progress on this topic will depend on improvements in diagnostic tests and on human and veterinary collaboration.

Space and space-time cluster analyses

- Using the program Satscan, input = cumulative incidence per four digit postal code area
- Search for known outbreaks and possible unexplained clusters

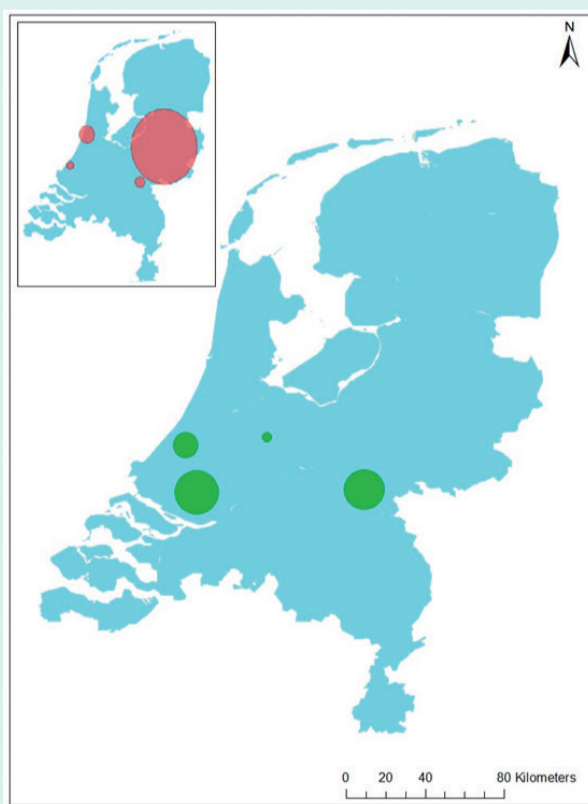


Figure 1: Space-time clusters psittacosis cases*
Upper left inset map: Spatial clusters of psittacosis cases*
* significance level of $P < 0.05$ maximum size of 50 kilometers; N=657 cases

Discussion

- Large cluster in a big poultry production area “the Gelderse vallei”
- 2 seaside city clusters → pet birds, ring-necked parakeets or wild birds? (pigeons, gulls)
- Limitation: Possible distortion by awareness and diagnostic methods

Data

Notified human cases of psittacosis in The Netherlands, reported from 2000 – 2013
• Inclusion criteria: valid postal code (PC4) → N=657

Individual poultry farm information from agricultural census (2012)
• Inclusion criteria for farms: >= 500 birds (exclude hobby farmers)

Spatial association between psittacosis infection notifications and poultry

- Only cases not related to known outbreaks included (N=621)
- Poisson regression analyses on a municipality level
- Correcting for spatial autocorrelation using the INLA approach within R (Bayesian)
- Nested structure of independent variables → specific ‘level-based’ model selection (based on DIC)

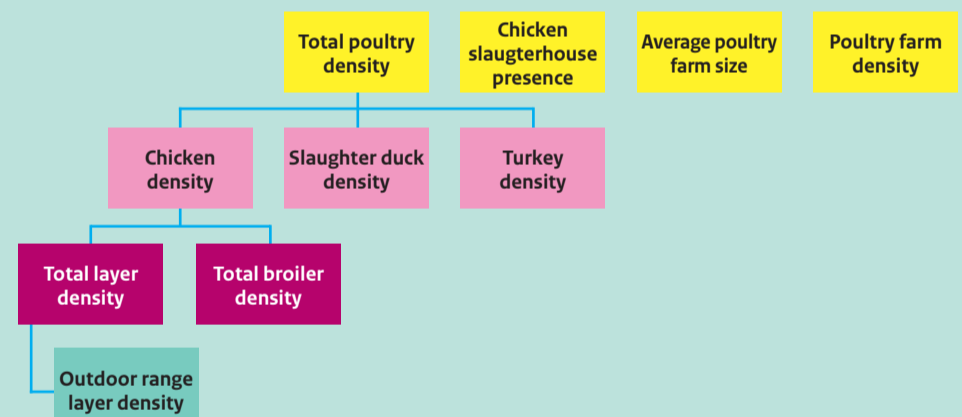


Figure 2: Diagram describing the nested structure of poultry-related variables. The levels grow in specificity, where level 1 is the most general and level 4 is the most specific. Level 1 = yellow, level 2 = light pink, level 3 = dark pink, level 4 = green.

Variables	RR(95%CI)
Chicken slaughterhouse presence	
Not present	1.00
Present	1.68 (1.06-2.64)
Slaughter duck farm presence	
Not present	1.00
Present (0-525,3 birds/km ²)	1.48 (1.02-2.10)

Table a: Final multivariable model with rate ratio’s (RR) and 95% credibility intervals (CI) for psittacosis infection notifications in the Netherlands, 2000 – 2013. A random effect term was added to account for spatial autocorrelation. N=415 municipalities (2012).

Discussion

- Chicken slaughterhouses and slaughter duck farms were found to be associated with human psittacosis in the general population
- *C.psittaci* found in air samples slaughterhouses (Dickx & Vanrompay, JMM, 2011)
- Stressed chickens excrete more *C.psittaci* (Harkinezhad et al, VM, 2009)
- Chickens enter slaughterhouse in open crates (possible easy contamination of the environment)
- *C.psittaci* shown to have a preference for ducks (Hulin et al, FEMS, 2015)
- Limitations: possible noise due to spatial issues (for example contamination outside the municipality), poultry information used from one specific year, only 15 municipalities with chicken slaughterhouses (power issues)